APPROVED FOR EXTERNAL USE

2024

MNS-MCC

ANSI low voltage motor control center

Document ID.: 1VAL117301-PP Rev.: A

MNS-MCC

ANSI low voltage motor control center

- First released in 2008
- Adopted from IEC MNS 3.0 design in UL845 package
- Serves ANSI/NEMA markets in US, Canada, Mexico, South America
- Common components from IEC design:
  - Vertical bus Multifunction Wall
  - Horizontal busbar mounting and bracing
  - Withdrawable units
  - Disconnecting power and control terminal blocks
- Type 2 arc-resistant MCC released in 2012
- Manufactured in San Luis Potosi, Mexico
- R&D headquarters in San Luis Potosi, Mexico

MNS-MCC AR/MNS-MCC

UL 845 MCC - Standards

Specific standards

- UL845
  - Low voltage motor control centers
- NMX-J-515-ANCE-2008
  - Equipos de Control y Distribución
- CSA C22.2 No. 254-05
  - Low voltage motor control centers

Complementary standard MNS-MCC AR

- IEEE C37.20.7
  - Guide For Testing Medium Voltage Switchgear for Internal Arcing Faults

Complementary standards

- UL50 - Enclosures for Electrical Equipment
- UL50E
  - Enclosures for Electrical Equipment, Environmental Considerations
  - UL 508 - Industrial Control Equipment
- NFPA 70E
  - National Electric Code Safety Requirements
- NEC - National Electric Code
- Seismic Qualification to IBC-2018, CBC-2019 & AC156
- IEEE 1584 - Arc Flash Calculations Standard

MNS-MCC AR

Overview

Technical data

Nominal voltage:

240 Vac, 380 Vac, 480 Vac, 600 Vac

System types

3 Phases, 3 Wires; 3 Phases, 4 Wires

Frequency: 50/60 Hz

Neutral bus (horizontal): 50% (800, 1200, 1600, 2000 & 2500A)

Bus neutral (vertical): 600 A

Ground bus: 400 A

Nominal current

Horizontal bus: 800 – 2500 A

Vertical bus: 800 A

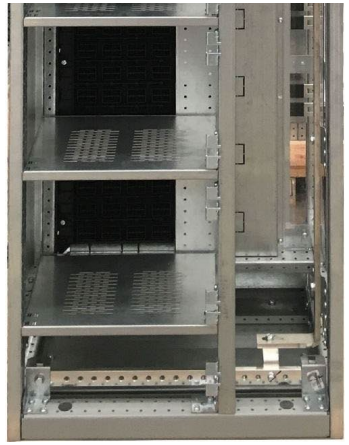
Short-circuit current (100ms): 65 kA @ 600 V

Enclosure: NEMA 1

MNS-MCC AR

Frame and finish

- Frame and shelves constructed with unpainted galvanized steel
- Exterior panels and doors painted galvanized steel (ANSI 61)
- C-channel construction for horizontal and vertical frame members
- Enclosure available in NEMA 1



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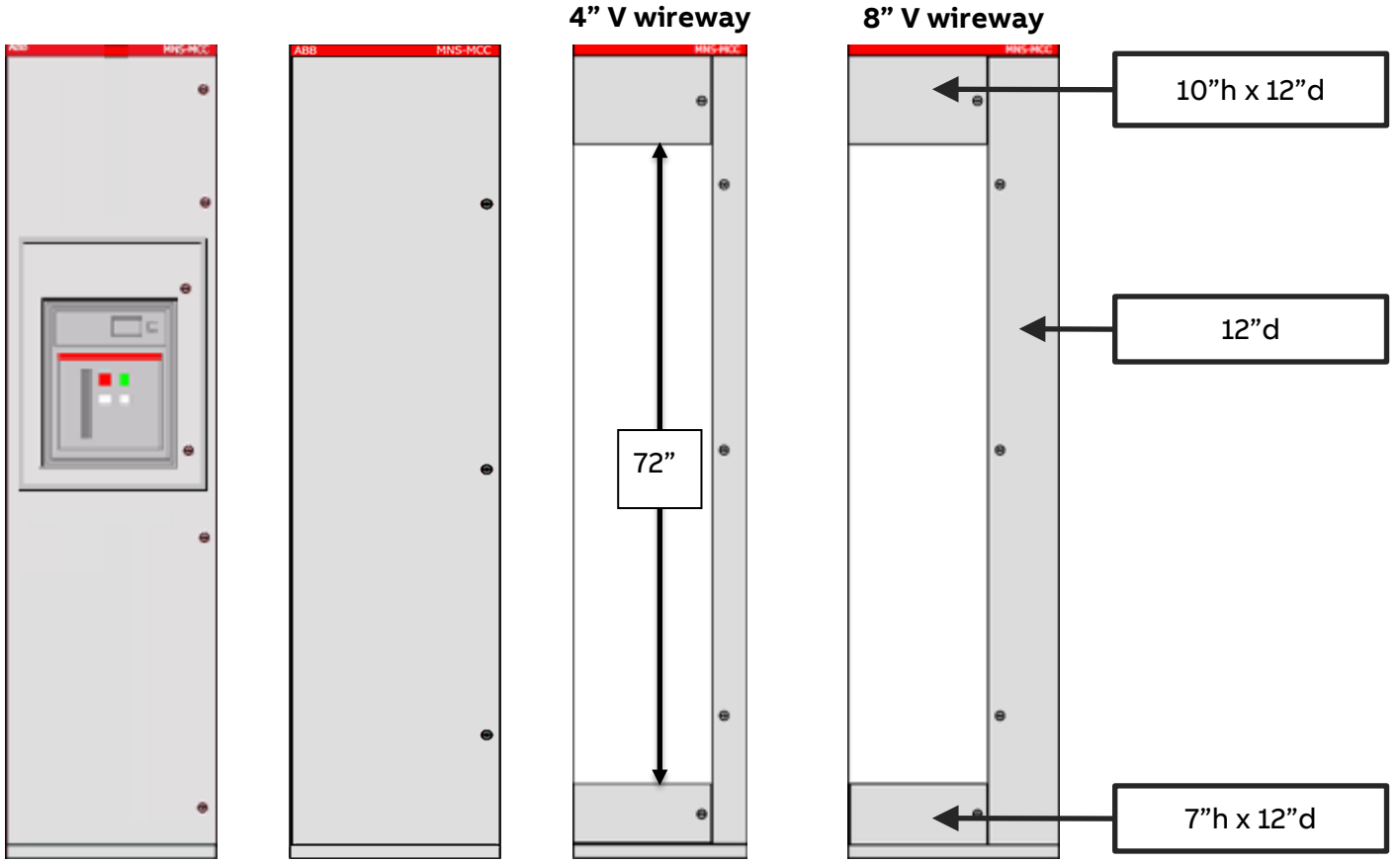
Section basics



800-2500A ACB 600-1200mm 32-44”

800-2500A FULL 500-1200mm 20-32”

800A Modular 500mm 20”

800A Modular 600mm 24”

MNS-MCC AR

Dimensions

Modular section dimensions

Height	92” (2300mm)
Width	20” (500mm) & 24” (600mm)
Depth	20” (500mm)
Top wireway height	10” (250mm)
Bottom wireway height	7” (175mm)

Wireway and unit space

Height	89” (2225mm)
Width (standard)	4” (100mm)
Width (optional)	8” (200mm)
Depth	12” (300mm)
Usable equipment space	72” (1800mm)
Spacing increments	6” (150mm)

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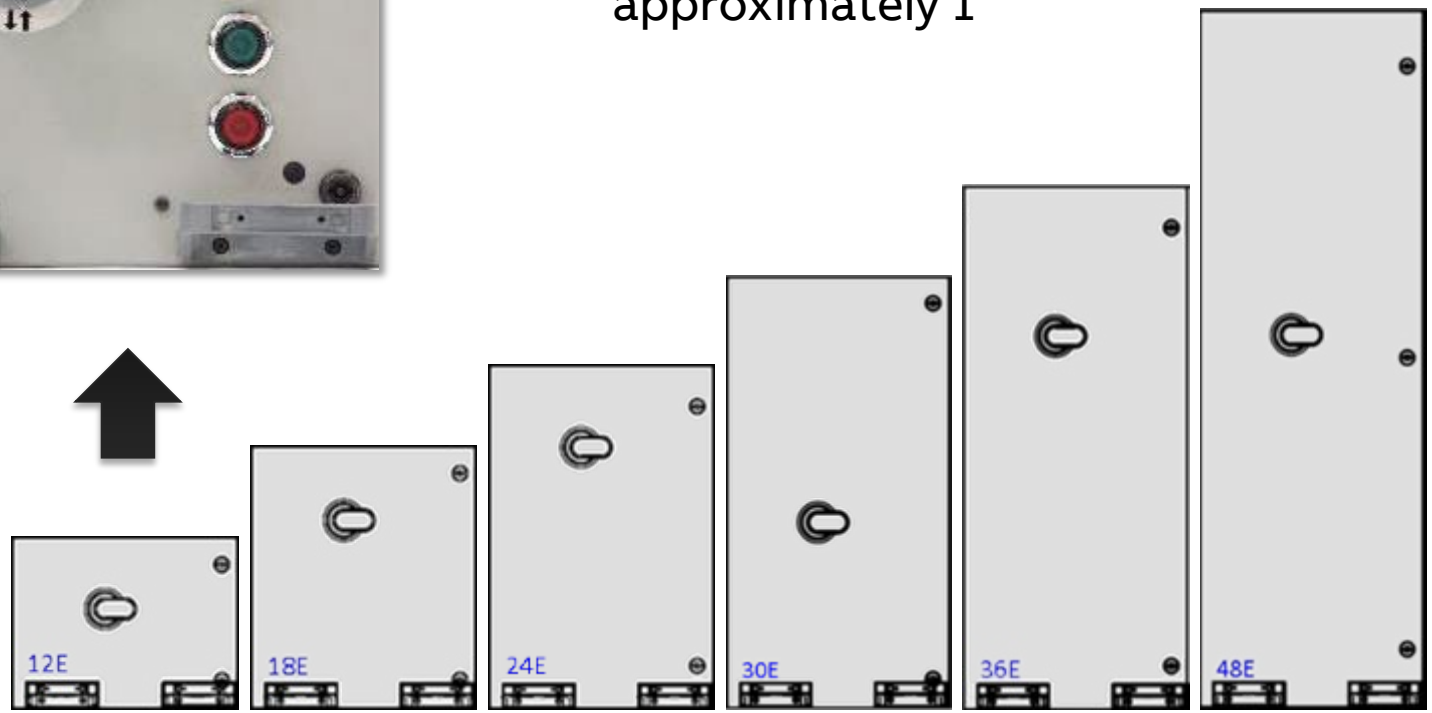
Unit basics

1E = 25mm,
approximately 1”



MNS-MCC AR

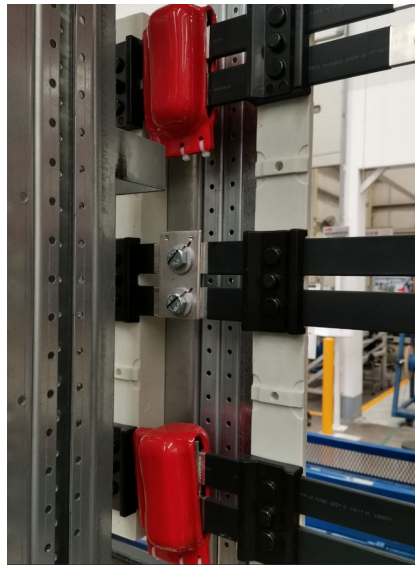
Horizontal busbar system

- Tin or silver plating available (tin-plating standard)
- Insulated bus available
- Bus splices accessible from front of MCC through cover panel in vertical wireway
- Option for continuous bus in a single shipping split

MNS-MCC AR

Horizontal busbar splice kit

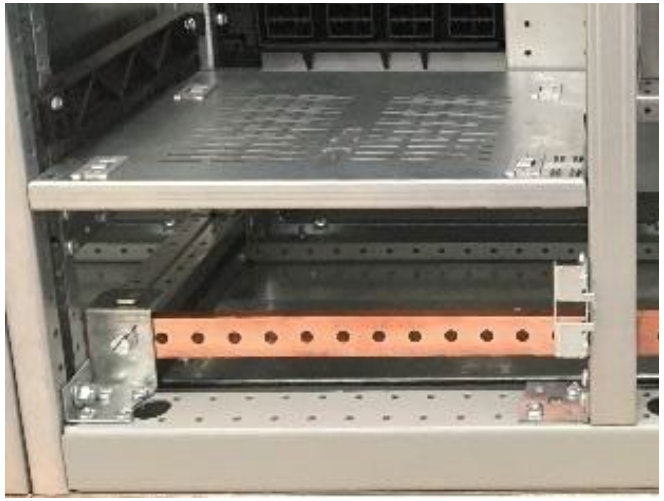
- Removable covers in rear of vertical wireway for access
- Removable insulating boots placed over splices
- Bolts use ES-Lock compound to maintain tightening torque



MNS-MCC AR

Ground bus

- 400 A unplated shown
- Plated options available
- 600 A option
- Option for continuous bus in a single shipping split
- Vertical ground bus in section available (with 7” wireway)
- Vertical ground bus in Multifunction Wall also available (optional)



MNS-MCC AR

Designed for safety

Hazard

– Inserting and removing MCC units in traditional design requires opening the door and wireway – exposing operators to energized components

ABB design

– Withdrawable design: tool-free, closed door unit removal

– Patented guide rail and rollers to guarantee alignment

– Can be locked out in the “disconnected” position preventing accidental energization

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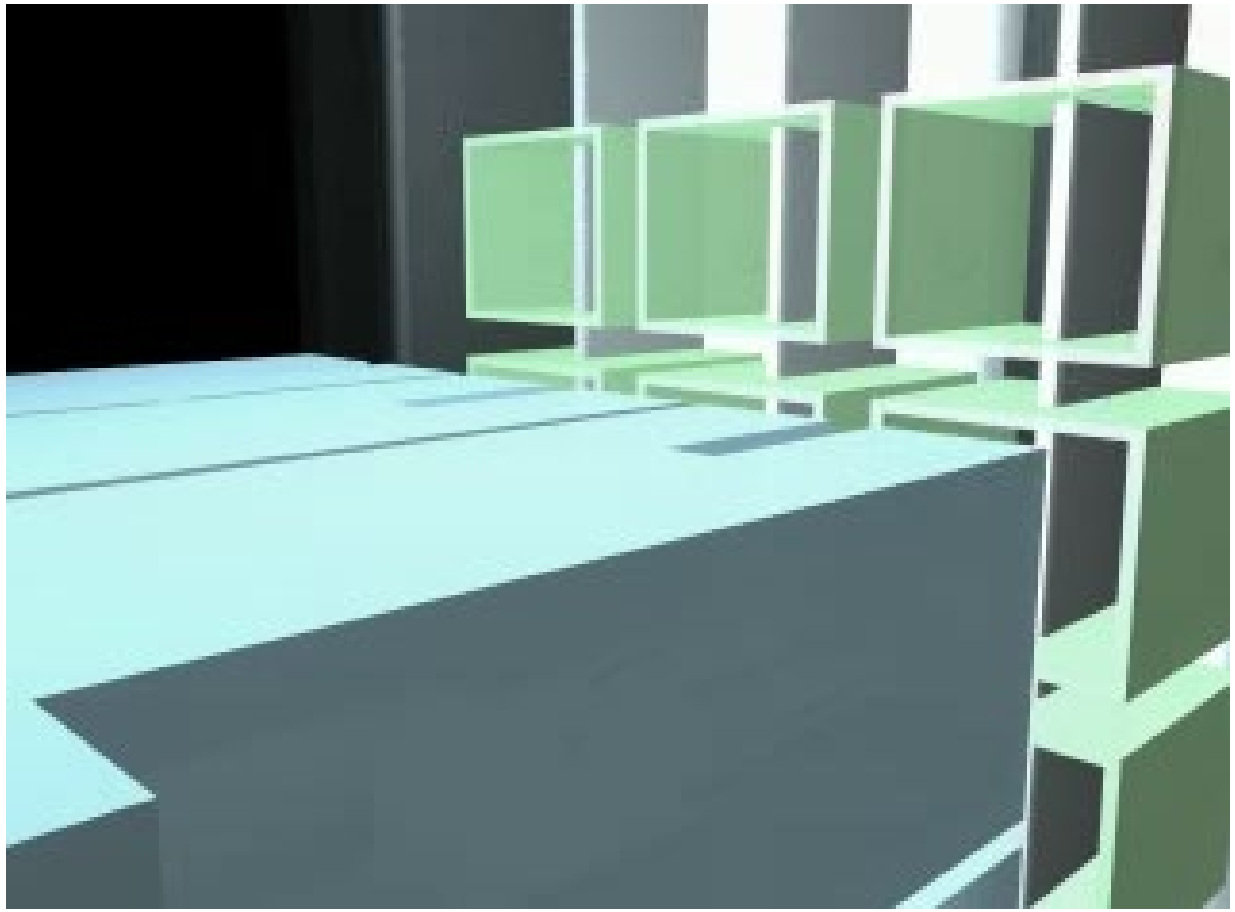
IP20 vertical bus Multifunction Wall

- Provides a physical barrier between operator and all busbars with an IP20 touch-safe design
- No exposed energized parts
- Mitigates phase-phase and phase-ground faults during insertion and removal of buckets
- Provides isolation and insulation between phases and between the bucket stabs
- No shutters to stick or maintain
- No need for stab-disconnecting mechanism in unit

Multifunction Wall

Isolated phases and stabs during insertion

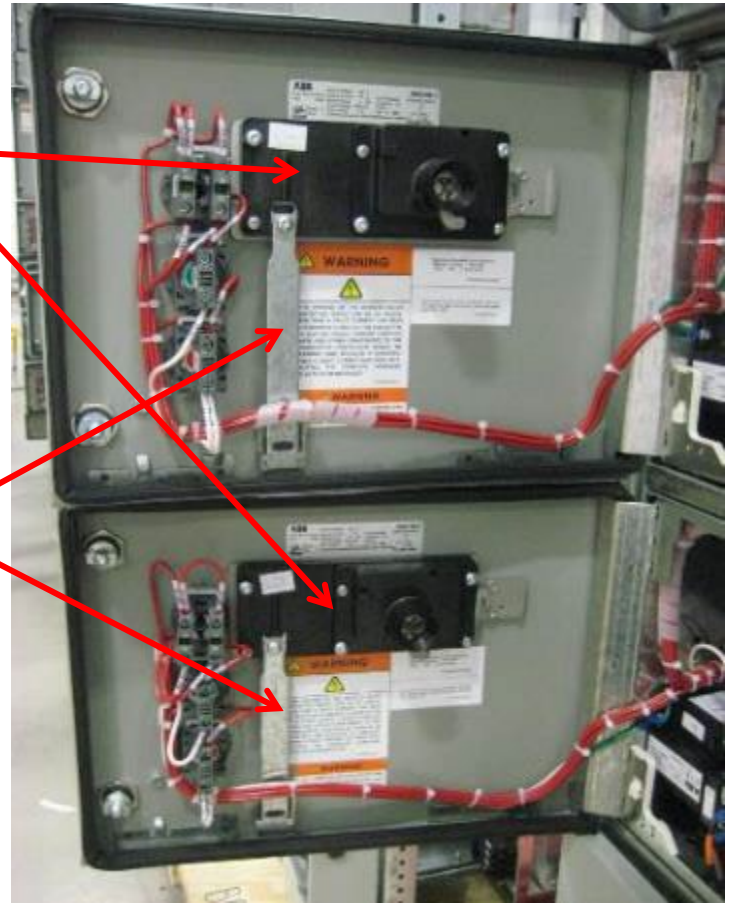


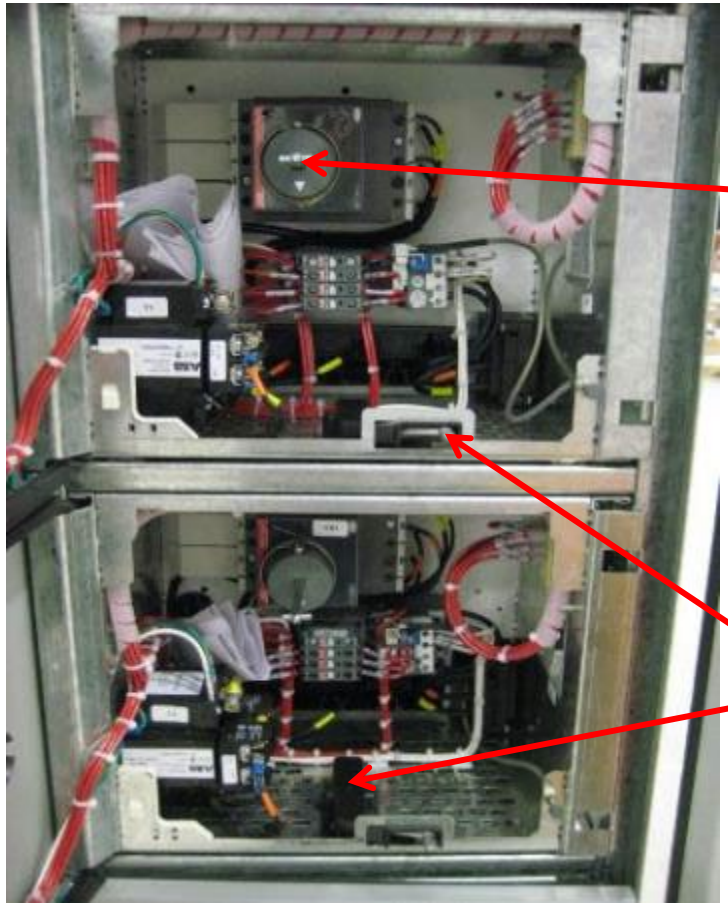
MNS-MCC AR

Withdrawable unit mechanism

Handle mechanism (‘black box’)

Push bar





Breaker shaft

Release lever

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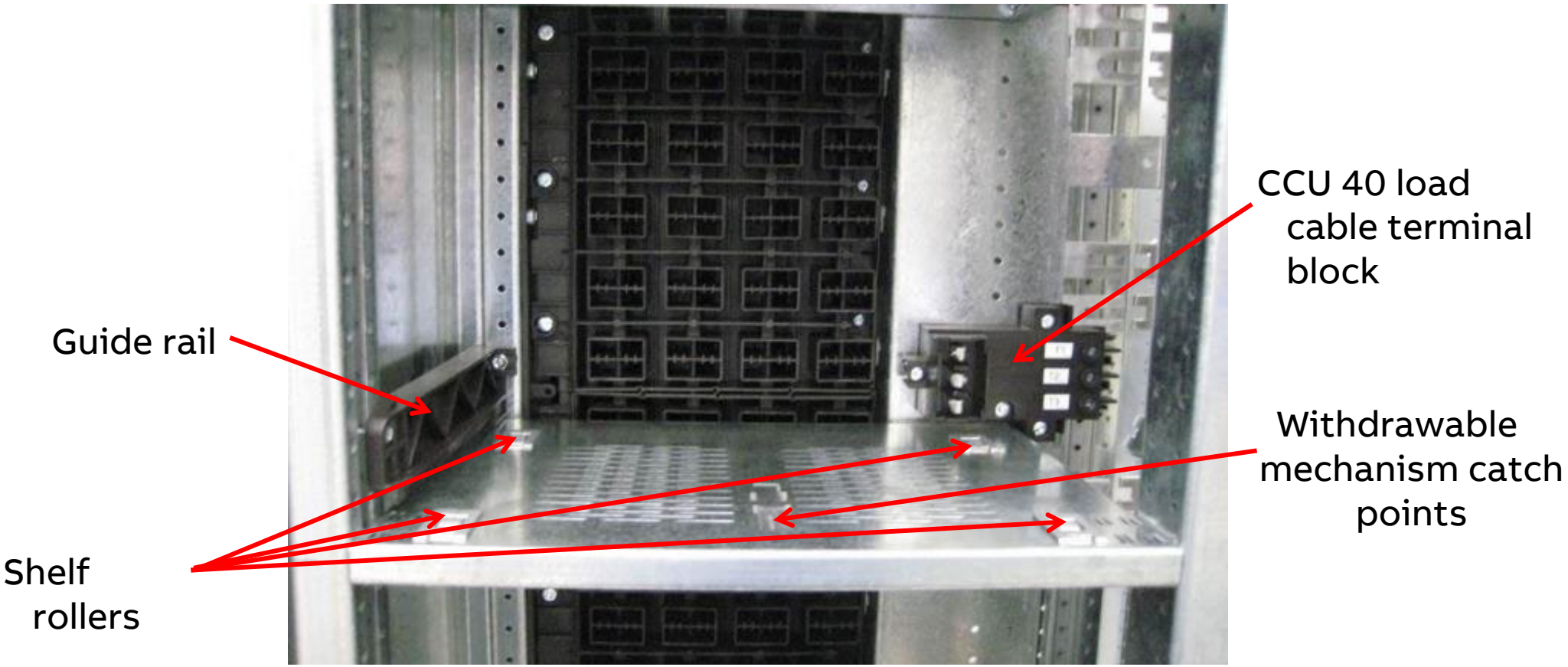
Unit space



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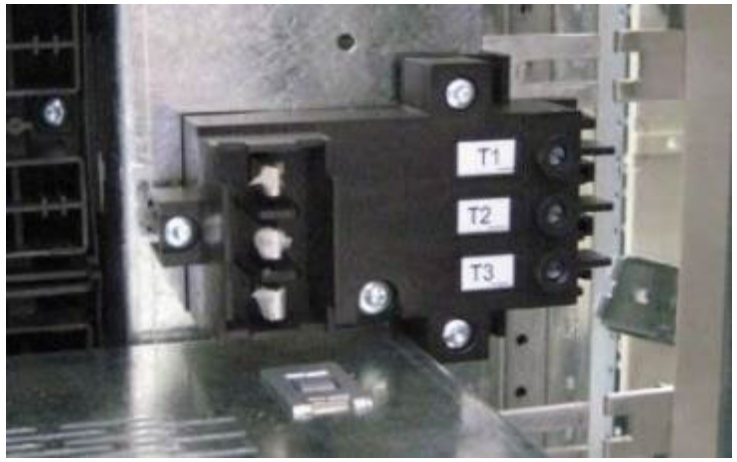
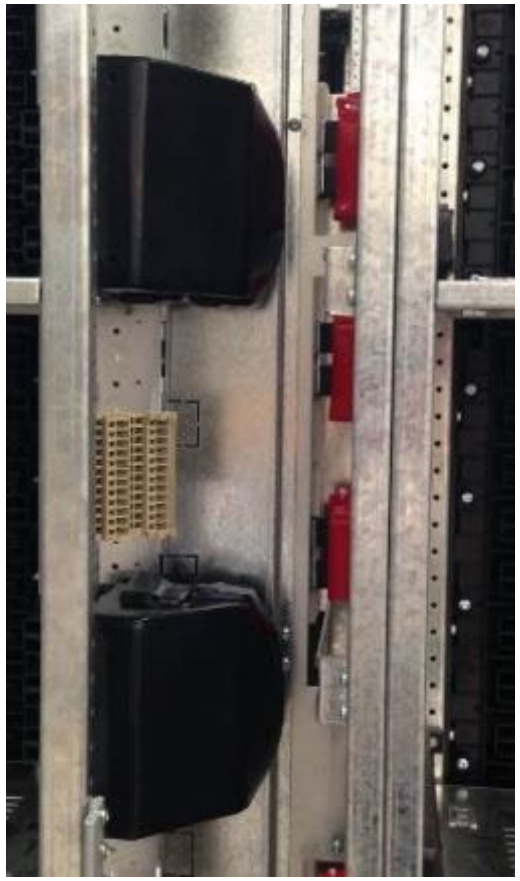
Disconnecting power terminal blocks

CCU40: 40 A, Fits 12-6AWG Load Cables



CCU300: 300 A, Max (2) 250MCM Load Cables



Protective boot for CCU300. Plexiglass shroud also available

8” wireway shown

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Control wiring terminal blocks

Unit side (movable)

Wireway side (fixed)

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General assembly and construction

Unit removable options without CCU

Option 1:

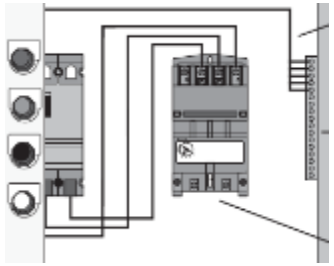
With Wiring Type BD, the user connects directly to the device terminals, which are located immediately adjacent and readily accessible to the vertical wireway.

Option 2:

Disconnect the power wiring from the starter power terminal blocks. Remove the top portion of the pull-apart control terminal blocks to which field wiring is connected.

Class 1 – Type BD

They are in the last device terminals

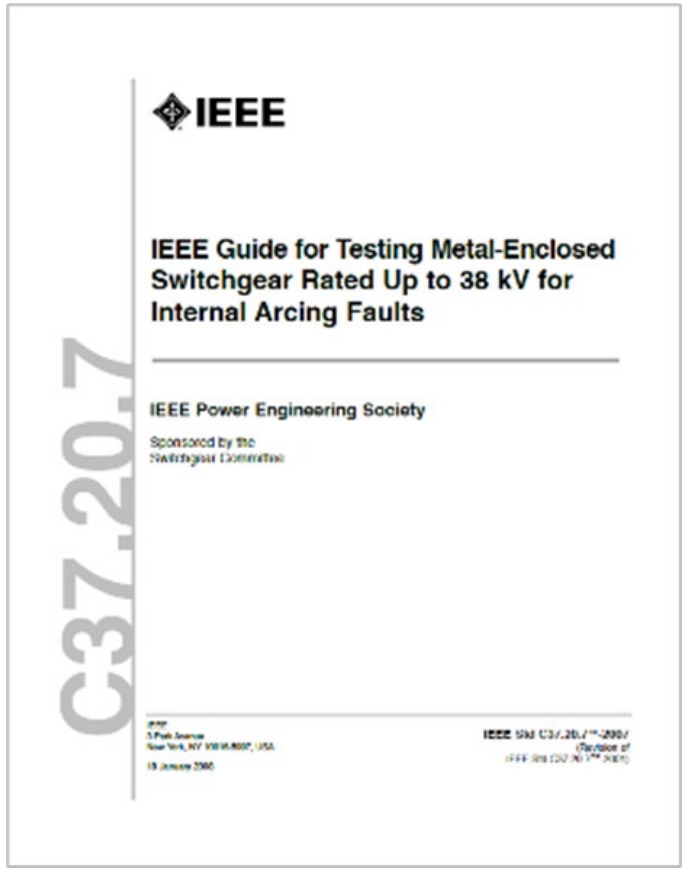


Standard pull-apart terminal blocks

The pull-apart terminal blocks from the unit and separate the wires for the extraction unit

Arc-resistant testing standard

ANSI/IEEE C37.20.7-2007



2007 Standard (no LVMCC specifics)
Present offering of MNS-MCC tested to this standard

MNS-MCC AR

Arc-resistance Standard No. C37.20.7

General

Laboratory:
DNV KEMA POWERTEST

Calibration:
KEMA 14051-B

Type: 2 or 2A
The arcing does not cause holes in the freely accessible front, sides or rear of the enclosure

Calibration information

- Test voltage: 635 V
- Test duration:
  - 500 milliseconds on buses, 30 cycles
  - 100 milliseconds on buckets, 6 Cycles
- Fault current RMS AC Sym:
  - 65 kA
- Highest peak value of fault current: 149.5 kA
- Frequency: 60 Hz

Test compartments

- Horizontal bus bar (insulated): up to 2500 A
- Vertical bus bar: 800 A
- Horizontal wireway: top and bottom
- Vertical wireway: 100 and 200 mm

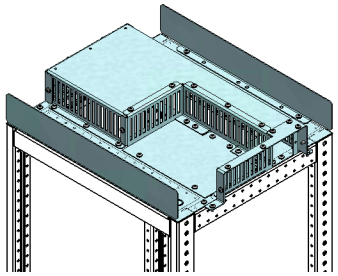
Test components

- Mains (ACB & MLO): up to 2500 A
- Feeders MCCB: up to 1200 A
- Feeders FD: up to 800A
- Starter Units with OL: up to 500 HP
- Drive Units: up to 300 HP normal duty / 250HP heavy duty
- Softstarter Units: Up to 200 HP 480V / 250 HP 600V

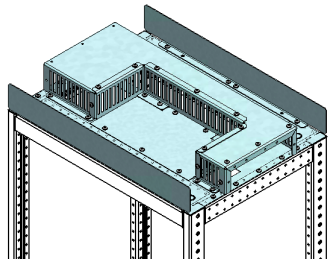
MNS-MCC AR vs non-arc-resistant

General assembly and construction

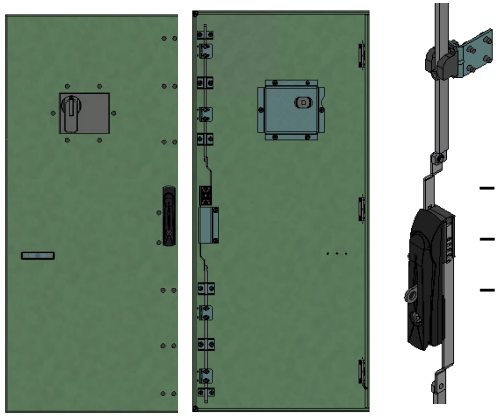
AR modular section



AR full section

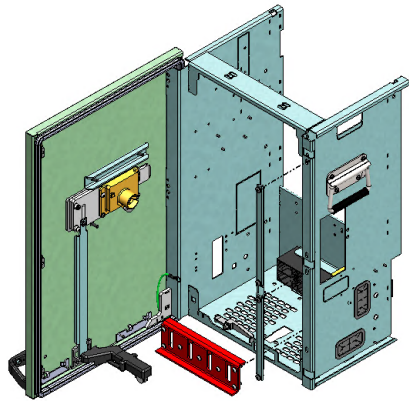


AR



- Swing handle
- More looks points
- No gasket

AR



- Reinforcement door, right side.
- More locks and hinges
- GPO-3 housing cover

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Components

Components AR:

Emax 2

Fixed version

Electronic OL Relay

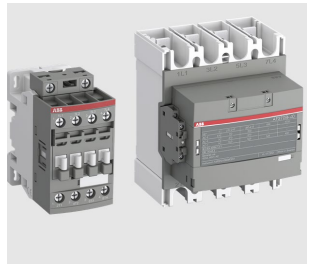
UMC 100.3

VFD ACS 880

Fuse Disconnect Switch & Tmax XT

Softstarters PSE

AF Contactors



MNS-MCC arc-resistant construction features

Horizontal bus insulation

Horizontal bus insulation system contains:

- Insulating boots on bus splices and busbar ends
- Heat shrink insulation on bus bars and bracing/mounting hardware
- Insulating caps on horizontal/vertical bus bar links

SACE® Emax® 2 air circuit breaker

Main incomers and feeders

- Carries UL 1066 label
- Compact Design
- Redesigned poles and operating mechanism
- Optimized terminal connections
- Expansion options – power, I/O, communications
- Ekip trip units provide sophisticated Main incomer interface for MCC
- Ekip Connect software for configuration, monitoring and diagnosis
- Emax 2 Network Analyzer – Advanced monitoring and event capture

MNS-MCC AR

ACB and MCCB

Table 22: Main or feeder molded case circuit breakers — voltage/SCCR | 480 V @ 100 kA | 600 V @ 65 kA

Unit type	System	Full load amps[1]	Unit size		Circuit breaker	Incoming cables	Max. cables per phase		Unit type
			Non-arc-resistant	Arc-resistant			Cable size (kcmil)	Qty.	
Main/feeders	3PH–3W	600	Half 20"W	Half 20"W	XT5 600 TMA	Top / bottom	500	2	Fixed
Main/feeders	3PH–3W	600	Half 20"W	Half 20"W	XT5 600 Ekip DIP[3]	Top / bottom	500	2	Fixed
Main/feeders	3PH–3W	800	Half 20"W	Half 20"W	XT7 800 Ekip DIP[3]	Top / bottom	500	4	Fixed
Main/feeders	3PH–3W	1200	Half 20"W	Half 20"W	XT7 1200 Ekip DIP[3]	Top / bottom	500	4	Fixed
Main/feeders	3PH–4W	1200	Full 24"W	Full 24"W	XT7 1200 Ekip DIP[3]	Top / bottom	500	4	Fixed
Tie	3PH–3W	800[2]	Full 24"W	Full 24"W	XT7 800 Ekip DIP[3]	Top / bottom	500	4	Fixed

1E of vertical space = 25 mm, approx. 1". Available for non-arc-resistant only.
[1] 80% rated
[2] 100% rated
[3] Available trip units LSI, LS/I, LSIG

Table 19: Main with air circuit breaker units — drawout and fixed breaker, voltage/SCCR | 480 V @ 100 kA | 600 V @ 65 kA

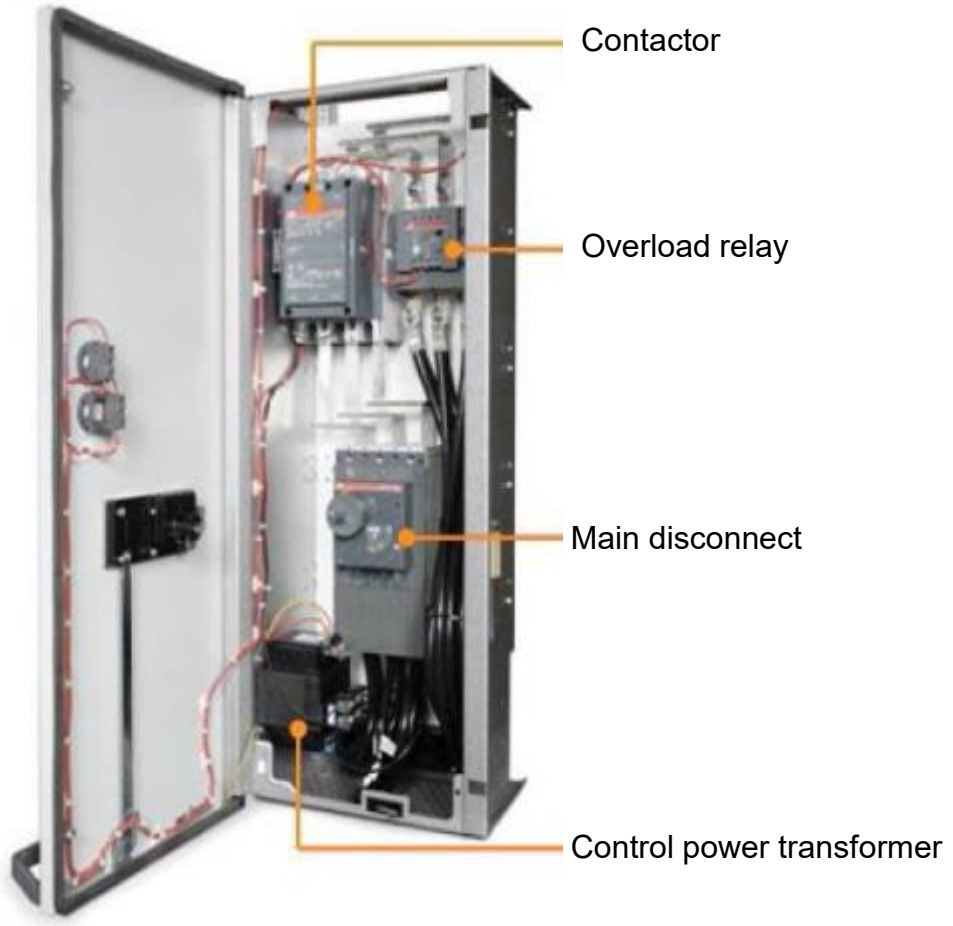
System	Full load amps	Unit size		Circuit breaker	Incoming cables	Max. cables per phase		Unit type
		Non-arc-resistant	Arc-resistant			Cable size (kcmil)	Qty.	
3PH-3W	800	Half 20"W/24"W[2]	–	E1.2	Top / bottom	500	4	Fixed
3PH-3W	800	Full 24"W	–	E2.2	Top / bottom	500	6	Fixed
3PH-3W	1200	Half 20"W/24"W[2]	–	E1.2	Top / bottom	500	6	Fixed
3PH-3W	1200	Full 24"W	–	E2.2	Top / bottom	500	6	Fixed
3PH-3W	1200	–	Full 32"W	E2.2	Top / bottom	600	3	Fixed
3PH-4W	1200	–	Full 44"W	E2.2	Top / bottom	600	3	Fixed
3PH-3W	1600	Full 24"W	–	E2.2	Top / bottom	500	6	Fixed
3PH-3W	1600	–	Full 32"W	E2.2	Top / bottom	600	4	Fixed
3PH-4W	1600	–	Full 44"W	E2.2	Top / bottom	600	4	Fixed
3PH-3W	2000	Full 24"W	–	E2.2	Top / bottom	500	8	Fixed
3PH-4W	2000	–	Full 32"W	E2.2	Top / bottom	600	5	Fixed
3PH-4W	2000	–	Full 44"W	E2.2	Top / bottom	600	5	Fixed
3PH-3W	2500	Full 32"W	–	E4.2	Top / bottom	500	12	Fixed
3PH-4W	2500	–	Full 32"W	E4.2	Top / bottom	600	6	Fixed
3PH-4W	2500	–	Full 44"W	E4.2	Top / bottom	600	6	Fixed
3PH-3W	3200	Full 44"W/48"W[1]	–	E6.2	Top / bottom	500	16	Fixed

Arc-resistant only for breaker fixed version
[1] 44" W when the unit goes at the sides of the lineup, 48" W when the unit goes in the middle of the lineup
[2] The unit width depends on the VWW selection

Across the liner starter units

Unit features

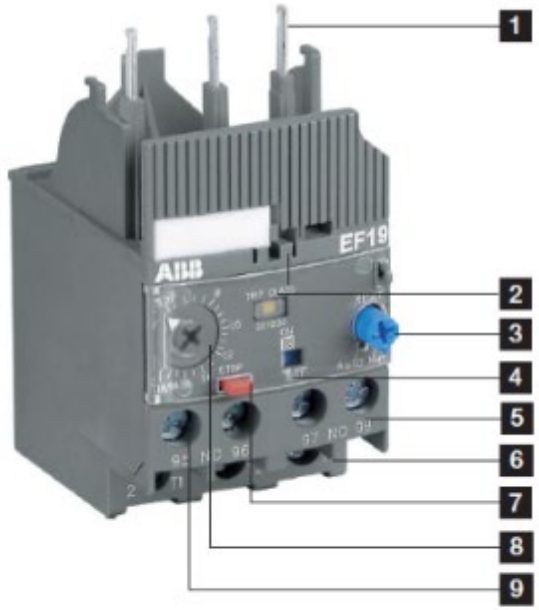
- Reversing and non-reversing starters (FVNR, FVR)
- Withdrawable up to NEMA size 4 (100hp at 480V, 125hp at 600V)
- Available up to NEMA 6 (400hp at 480V, 500hp at 600V)
- MCP disconnects, fused disconnects available
- Vacuum contactors available for NEMA sizes 4
- 2 speed options available – consult factory
- Reversing starters available up to NEMA size 3 (50hp at 480V, 60hp at 600V)
- CPT VA increases allowed, can impact unit size
- ABB contactors – all use 120Vac coils



Overload relay options

ABB E-Series electronic overloads

- Provides thermal protection with current adjustment dial
- Phase loss protection
- Adjustable trip class (10, 20, 30)
- Mechanical RESET pushbutton
- Auto RESET enable/disable
- STOP button toggles overload contact 95-96
- Larger sizes use external current transformers



1 Terminals (1L1, 3L2, 5L3)

2 Trip class 10E, 20E, 30E selectable

3 RESET button
Automatic or manual reset selectable

4 Status indication

5 Signaling contacts 97-98

6 Terminals 2T1, 4T2, 6T3

7 STOP button

8 Current setting range
Adjustable current setting for overload protection

9 Tripping contacts 95-96

Overload relay options

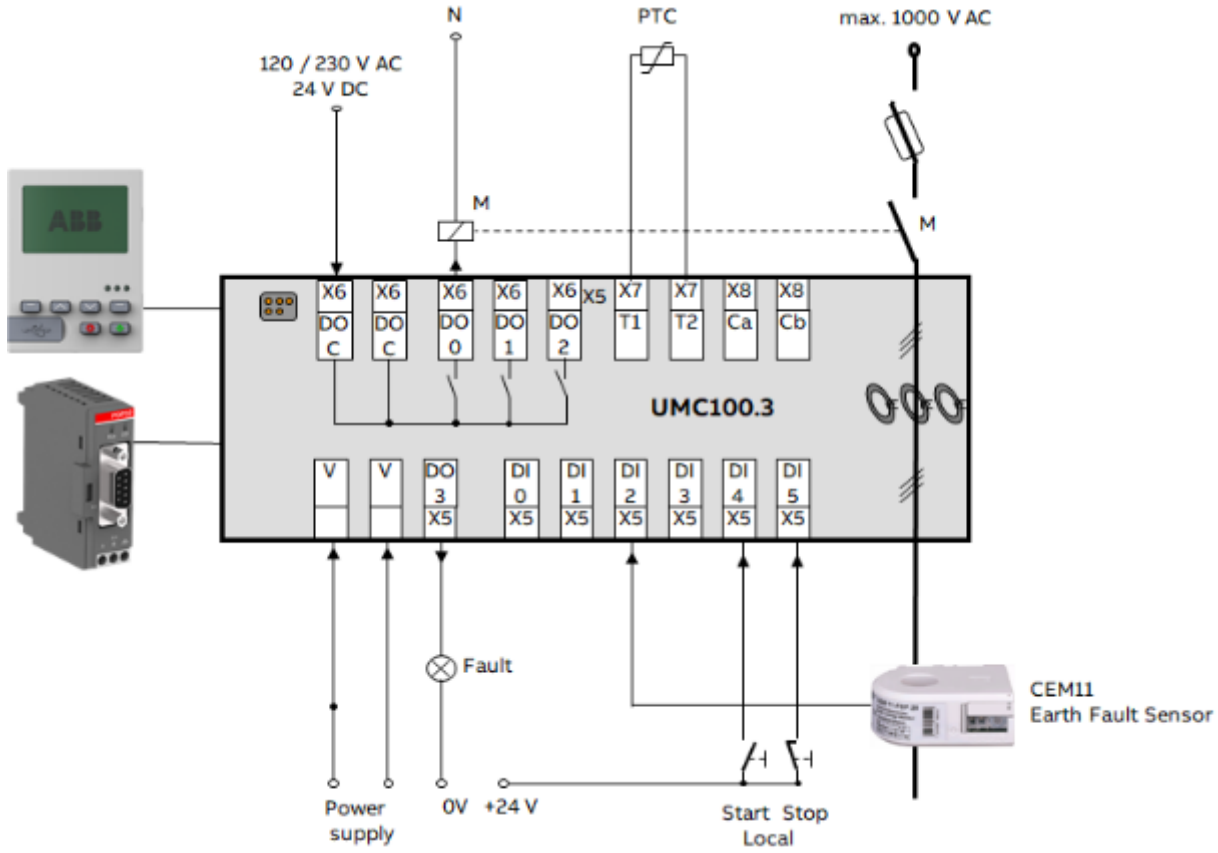
UMC100.3 microprocessor programmable overload relay

- Protection features
  - Thermal overload
  - High current, low current
  - Ground fault (internal calculation or external sensor)
  - Phase loss, imbalance, reversal
  - Under/over voltage
- Monitoring
  - Number of starts
  - Time to trip, thermal capacity (%)
- Up to 63A in base module
- 24Vdc supply or 120Vac supply
- Communication options
- Voltage monitoring option
- 6 discrete inputs (24Vdc only), 3 relay outputs
- Custom logic programming to simplify starter wiring

UMC100.3

Control circuit

- Non-reversing starter shown, control function set to ‘direct starter’
- CEM11 for ground fault detection, offers more sensitivity than internal calculation
- Diagram here shows previous generation version of UMC100.3: round connector for fieldbus plug, previous revision of keypad without USB connection



UMC100.3

Accessories and option modules

- DX111: 8 discrete inputs 24Vdc, 4 relay outputs, 1 analog output 0/4-20mA or 0-10V (configurable)
- DX122: Same as DX111, inputs are 120Vac
- AI111: Analog input module 0/4-20mA or 0-10V (configurable) with PTC inputs
- Both require 24Vdc power and comm connection to UMC100.3 base module

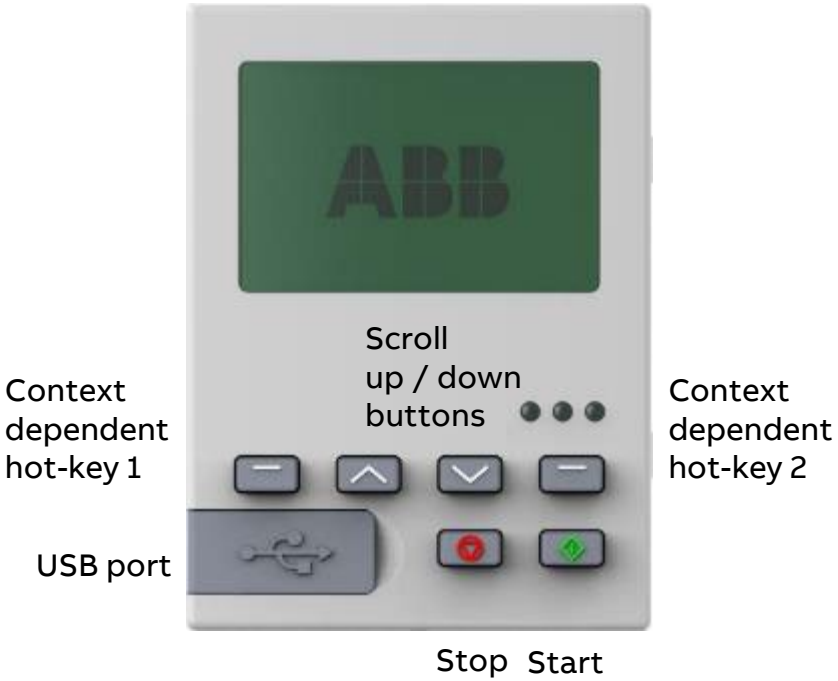
- VI150: Voltage module for ungrounded systems
- VI155: Voltage module for grounded or ungrounded systems
- Requires 24Vdc power and comm connection to UMC100.3 base module

- CT4L/CT5L: external current transformers for currents higher than 63A

- CEM11 ground fault sensors:
  - 4 versions available: 80-1700mA, 100-3400mA, 120-6800mA, 300-13600mA
  - Settings made with rotary switch
  - Reports contact closure to UMC100.3 when threshold crossed

UMC100.3 HMI

Local operator interface



Monitor

- Status
- I/Os
- All values: phase currents (A, %), line voltage, analog inputs …
- Faults and warnings
- User defined information and diagnosis

Operate

- Start, Stop, Fault, Acknowledge

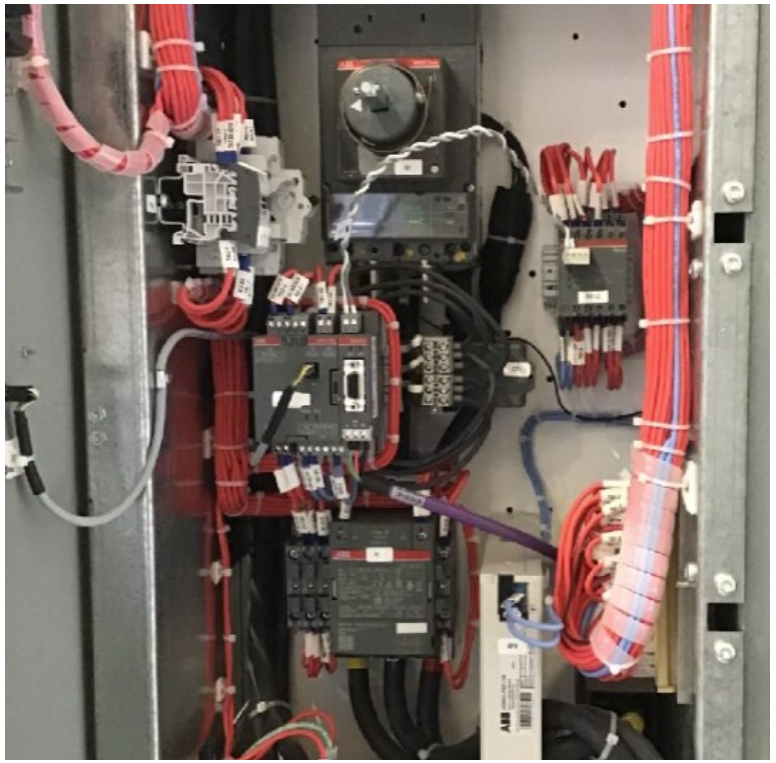
Configure

- All parameters can be set/changed via keypad or service laptop (USB)
- Optional password protection
- Copy parameters and/or logic for backup

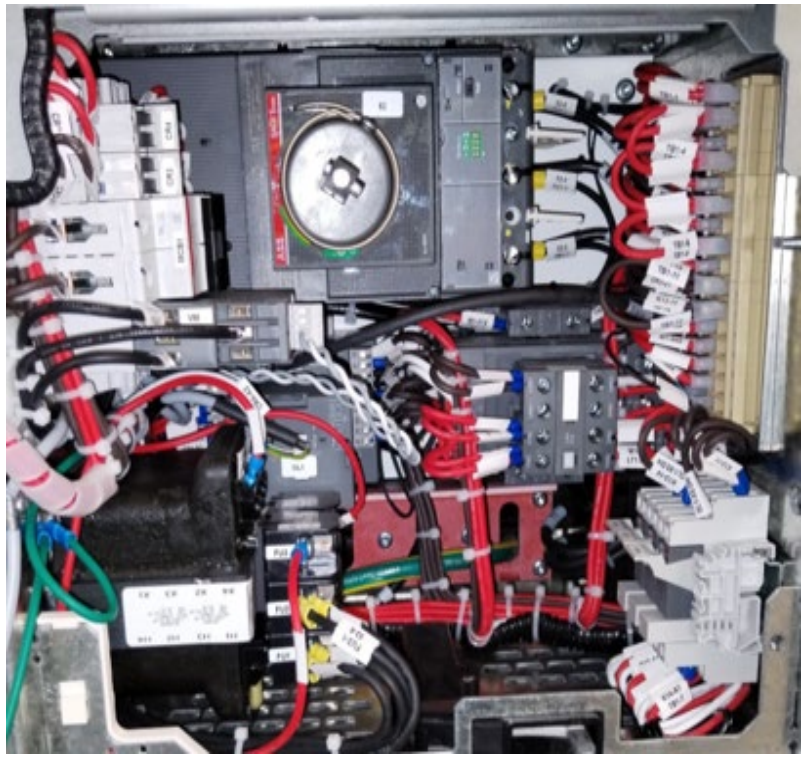
UMC100

Installation (with accessories)

CTs, GF sensor, I/O and communication modules



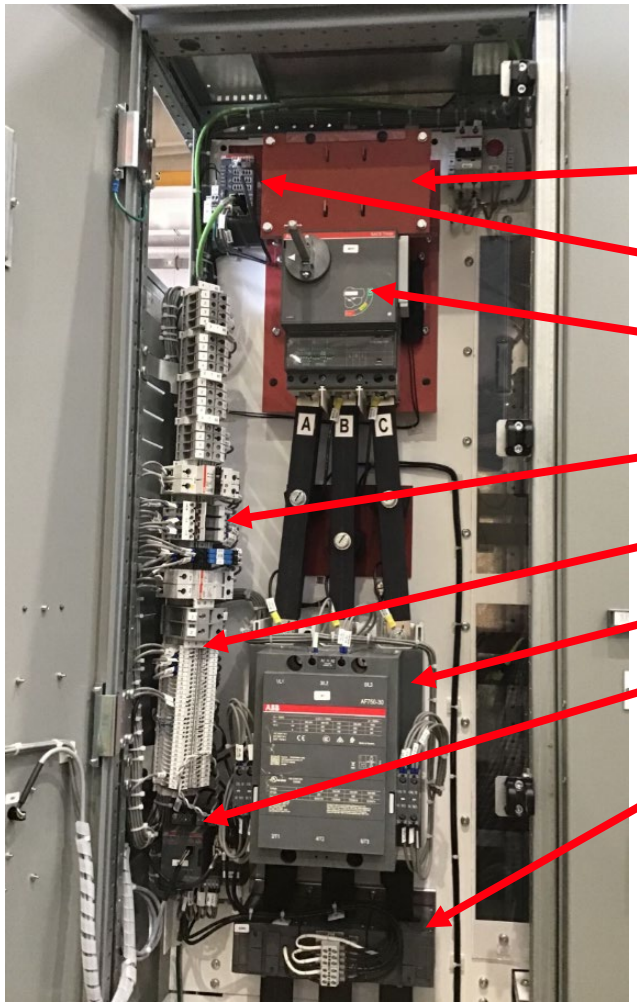
Voltage module



Starters shown

- FVNR starters shown
- UMC100.3
- DX122 I/O module
- CT4L
- CEM11
- VI155
- PDP32 and FBP

Example NEMA size 6 (480VAC)



- Line connection
- Connection terminals to load
- Communication module
- XT5 breaker
- Control relays
- Control wiring terminals
- NEMA size 6 contactor (120VAC coil)
- UMC100.3
- External current sensor
- Control power transformer

UMC100.3

Communication options

Ethernet communications

- Profinet (with PNQ22) or Modbus TCP/IP (with MTQ22): Single device mounted in wireway, services up to four UMC100.3 overloads with one device
- MTQ22 requires software tool for commissioning, ABB Config Tool, connection via USB port
- PNU32.0 for Profinet, supports S2 redundancy
- EIU32.0 for Ethernet/IP

Serial fieldbus communications

- Profibus DP-V1: PDP32 (also PDR31 for active termination)
- Modbus RTU: MRP31
- Serial communication interfaces can be mounted on overload base module or in wireway

Softstarter

PSE-The efficient range

Overview

Designed to meet common requirements in the Water segment and for specialized operation pumps.

It combines protection commonly used with a compact design bypass. Remote operation with display kit and kit communication protocol (optional).

The PSE softstarter range is the world’s first compact softstarters with Torque Control. An excellent choice for pumping applications where water hammering is normally a big problem. With its compact design and advanced functionality, it is also an efficient solution for other common applications such as compressors and fan torque control. The most important function when stopping pumps is torque control.

Softstarter

PSE-The efficient range

Description

Typical applications:

- Bow thruster
- Centrifugal pump
- Compressor
- Conveyor belt (short)
- Elevator
- Escalator
- Centrifugal fan
- Conveyor belt (long)
- Crusher
- Mill
- Mixer
- Stirrer

- The perfect compromise
- Small and medium sized motors
- Designed for pump applications

Variable Frequency Drive (VFD) units

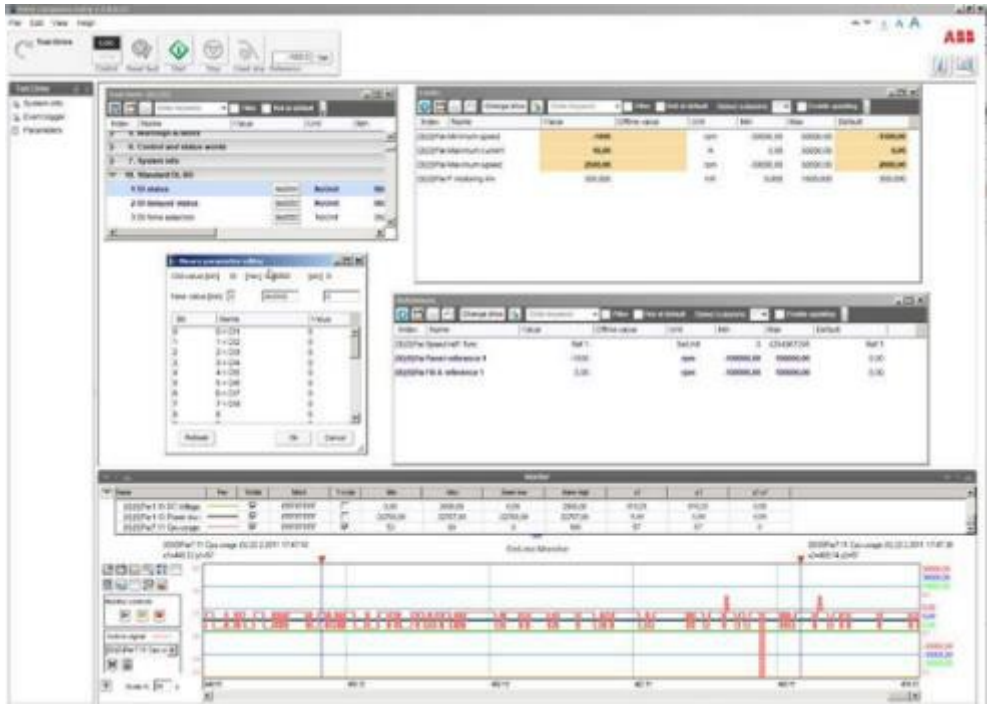
ACS880 industrial drives

- Full-featured VFD with programming macros for wide range of applications
- Available up to 300hp at 480V
- Smallest withdrawable unit: 30E (30”) for 1hp
- 50hp-100hp uses 700mm (28”) wide half-section (no vertical bus)
- Door-mounted keypad standard; can store parameter sets
- Output filter options – dv/dt filter and sine wave filters for long motor lead lengths (may require VFD size increase)
- Line reactor/filter options not in standard offering yet (for IEEE 519 requirement)
- Heavy duty vs. standard duty: tables in Application Guide assume heavy duty, standard duty can have smaller space requirement

Variable Frequency Drive (VFD) units

ACS880 modules and software

- Input/output extension modules
- Full range of communication options with expansion cards
- Ethernet Protocols single option card for Modbus TCP/IP, Profinet, Ethernet/IP
- MRP and S2 redundancy supported for Profinet
- Ethernet adapter has dual port option
- Asset management with Drive Composer software, USB connection via keypad



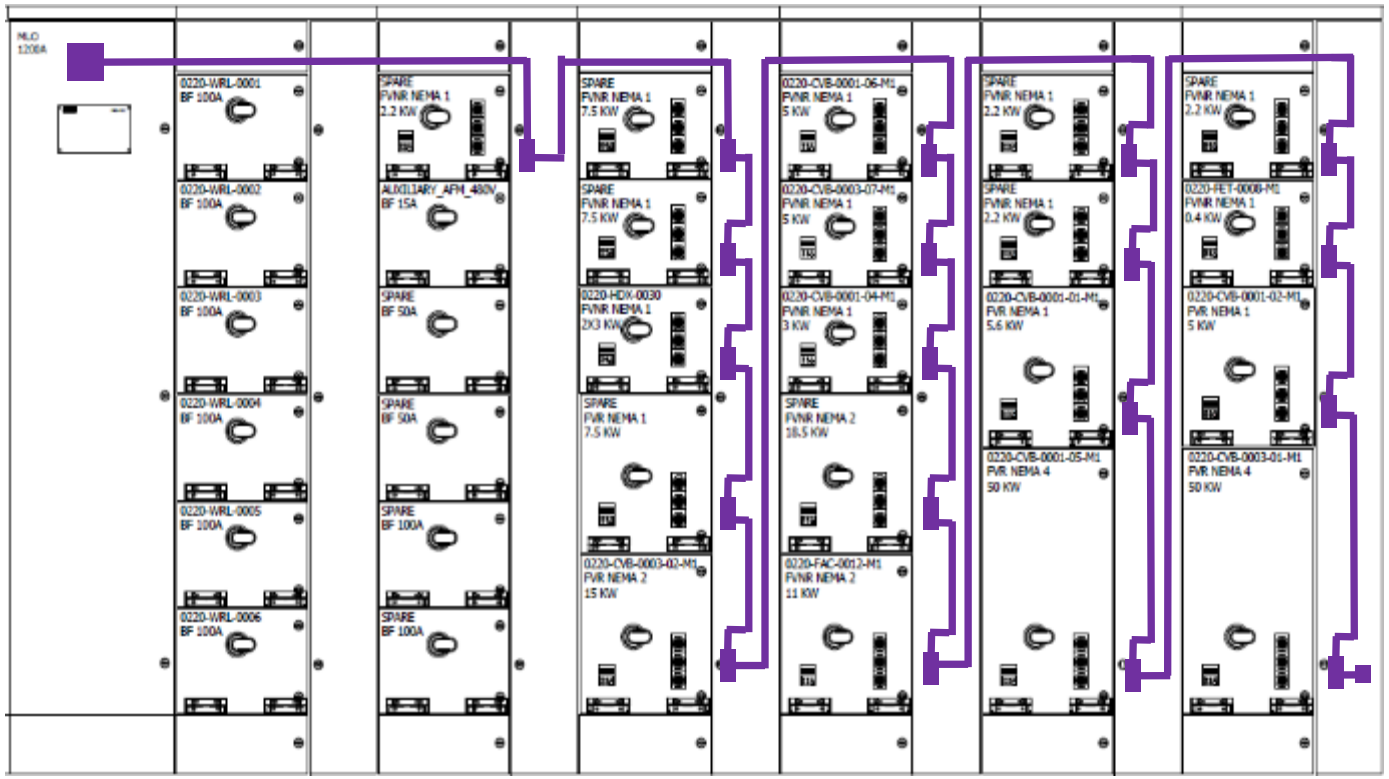
Other unit types

- SPD
- Full voltage contactor units: starter with no overload and molded case circuit breaker disconnect (thermal-magnetic protection)
- High resistance ground section (Post Glover typically, non-UL)
- PLC cabinet
- Mains metering: Electro-Industries Shark 200 or Nexus 1500 typical, can be substituted with customer preference. ABB meters are non-UL

Intelligent MCC

Factory-wired serial network

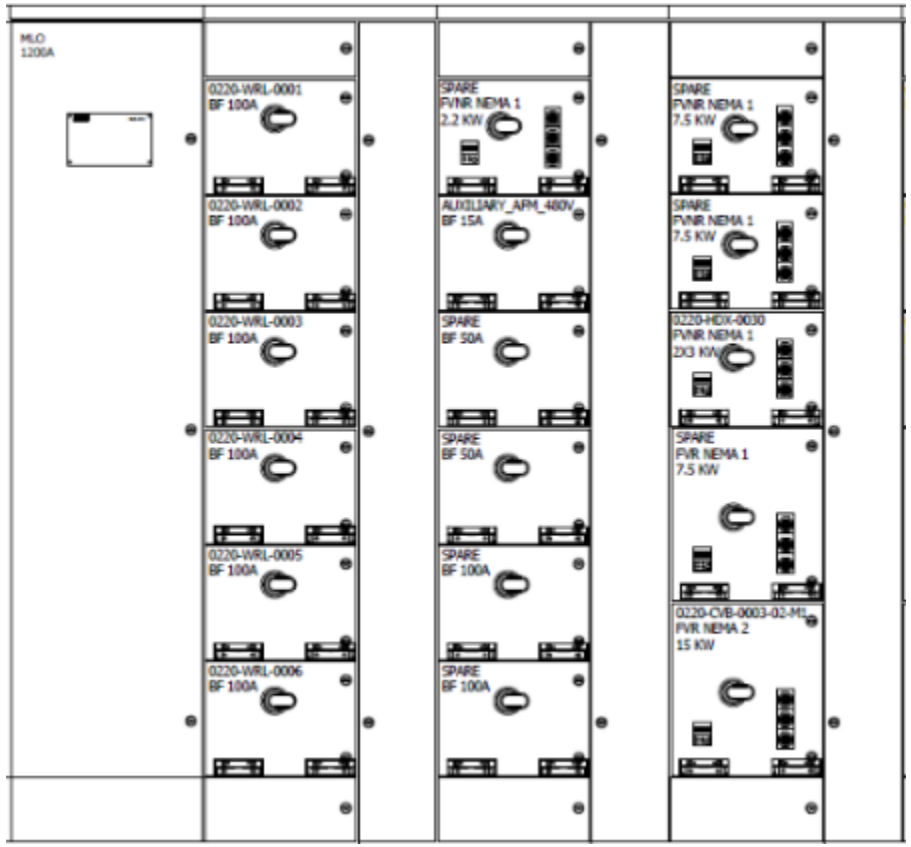
- Connection to each device made with factory installed network cable
- Daisy-chain topology for serial communication protocols
- Connections to intelligent devices can be in MCC unit or in wireway, depending on device or preference
- Terminating resistors provided where necessary
- MCC sections with 200mm (8”) wireway have communication wiring space with metal cover to separate communication lines from power cables



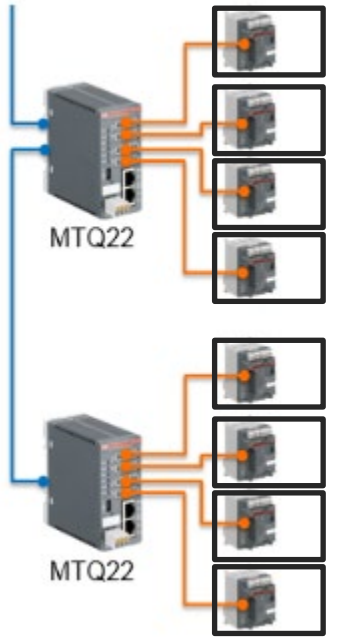
Intelligent MCC

Factory-wired Ethernet network

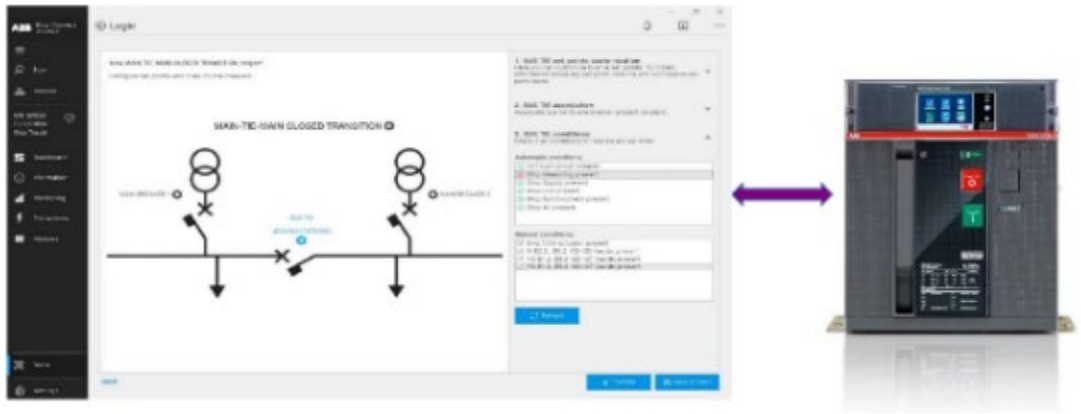
- For Profinet, Modbus TCP/IP and Ethernet/IP networks
- MTQ22, PNQ22, EIU32.0 mounted in wireway, 24Vdc power from MCC supply bus
- Daisy chain Ethernet topology typically used for starters and VFDs
- Supports redundant ring topologies
- Dual-star topologies can be supported
- VFD connections to networks made in units, Ethernet cable not wired to pull-apart terminal blocks
- Ethernet switches can be provided in MCC for single customer connection point
- Switches can have fiber ports for external network connections. Copper Ethernet used in MCC



UMC100.3 in withdrawable unit

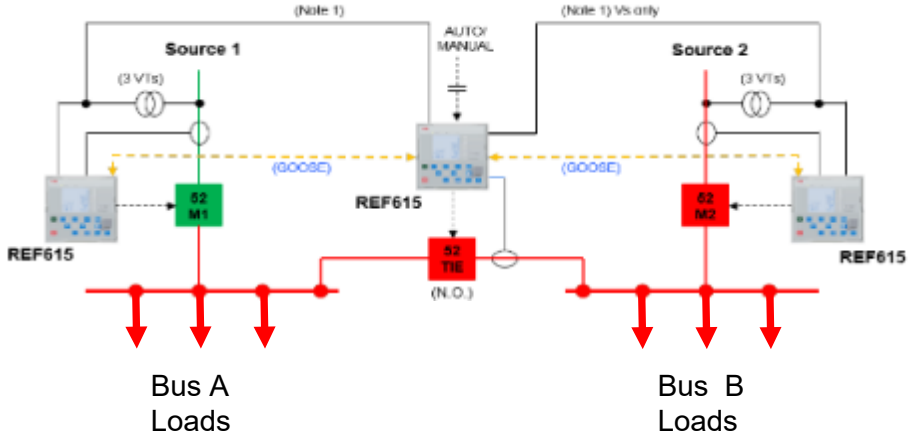


Automatic transfer systems in MNS-MCC



Embedded ATS with Emax 2 Ekip trip units

- Status and commands between trip units via communications link
- Control and Monitoring at Ekip LCD or separate touch screen (Ekip View)



ATS with REF615 relays

- Implementation is more complex than Embedded ATS
- Complete control of transfer sequence
- REF615 can replace protection functions of MTM trip units


ABB